

T10D08 – 10.5-6 IB Practice

Name.....

1. Which species reacts most readily with propane?
- A. Br_2
B. Br^\bullet
C. Br^-
D. Br^+
2. Which substance is **not** readily oxidized by acidified potassium dichromate(VI) solution?
- A. propan-1-ol
B. propan-2-ol
C. propanal
D. propanone
3. What is the reaction type when $(\text{CH}_3)_3\text{CBr}$ reacts with aqueous sodium hydroxide to form $(\text{CH}_3)_3\text{COH}$ and NaBr ?
- A. Addition
B. Elimination
C. $\text{S}_{\text{N}}1$
D. $\text{S}_{\text{N}}2$
4. Propane, C_3H_8 , undergoes incomplete combustion in a limited amount of air. Which products are most likely to be formed during this reaction?
- A. Carbon monoxide and water
B. Carbon monoxide and hydrogen
C. Carbon dioxide and hydrogen
D. Carbon dioxide and water
5. An organic compound **X** reacts with excess acidified potassium dichromate(VI) to form compound **Y**, which reacts with sodium carbonate to produce $\text{CO}_2(\text{g})$.
What is a possible formula for compound **X**?
- A. $\text{CH}_3\text{CH}_2\text{COOH}$
B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
C. $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
D. $(\text{CH}_3)_3\text{COH}$
6. The hydrolysis of 2-iodo-2-methylpropane by $0.10 \text{ mol dm}^{-3} \text{ KOH(aq)}$ to form 2-methylpropan-2-ol is an example of nucleophilic substitution.
Give equations to illustrate the $\text{S}_{\text{N}}1$ mechanism for this reaction.

(Total 2 marks)

7. The molecular formula $\text{C}_4\text{H}_9\text{Br}$ represents four structural isomers, all of which can undergo nucleophilic substitution reactions with aqueous sodium hydroxide. An equation to represent all these reactions is
- $$\text{C}_4\text{H}_9\text{Br} + \text{NaOH} \rightarrow \text{C}_4\text{H}_9\text{OH} + \text{NaBr}$$
- (a) Explain what is meant by the term *nucleophilic substitution*. (2)
- (b) The main mechanism for a tertiary halogenoalkane is $\text{S}_{\text{N}}1$. Give the equations for this substitution reaction of the tertiary isomer of $\text{C}_4\text{H}_9\text{Br}$. Show the structures of the organic reactant and product and use curly arrows to show the movement of electron pairs. (4)

- (c) The main mechanism for a primary halogenoalkane is S_N2 . Give the mechanistic equation for this substitution reaction of the straight-chain primary isomer of C_4H_9Br , showing the structures of the organic reactant and product, and using curly arrows to show the movement of electron pairs.

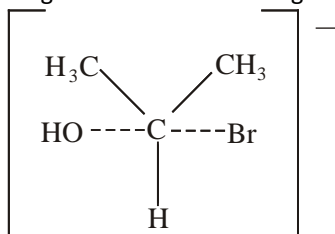
(4)

- (d) Give a structural formula for the secondary isomer and for the other primary isomer. State the name of each isomer.

(4)

(Total 14 marks)

8. The following transition state is formed during the reaction of a halogenoalkane with aqueous sodium hydroxide:



- (a) Deduce the structure of the halogenoalkane. Classify it as primary, secondary or tertiary, giving a reason for your choice.

(2)

- (b) The mechanism of this reaction is described as S_N2 . Explain what is meant by the symbols in S_N2 . Predict a rate expression for this reaction.

(3)

- (c) The same halogenoalkane reacts with sodium hydroxide by an S_N1 mechanism. Deduce the structure of the intermediate formed in this reaction.

(1)

(Total 6 marks)